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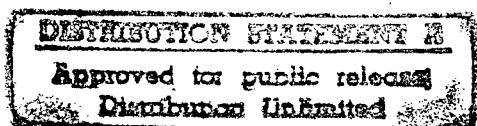
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TENTH SCIENTIFIC SESSION OF THE INSTITUTE OF
SURGERY IMENI A. V. VISHNEVSKIY OF THE
ACADEMY OF MEDICAL SCIENCES USSR

- USSR -

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TENTH SCIENTIFIC SESSION OF THE INSTITUTE OF
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This is a translation of an article written by
A. V. Afanas'yeva and Z. Ya. Degtyareva in Vestnik
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The Tenth Scientific Session of the Institute of Surgery imeni A. V. Vishnevskiy was held on 12 and 13 November 1958 in Moscow and was devoted to two problems: 1) operations on the "dry" heart (ten reports); 2) alloplasty in surgery (13 reports). At the opening of the session the head of the Institute, A. A. Vishnevskiy, stressed that the problem of intra-cardiac operations was discussed in the Soviet Union for the first time on such a vast scale.

The problem is being worked upon at the present time throughout the entire world. The idea of the possibility of operating on the "dry" heart under the control of vision originated, and its experimental realization accomplished, in our own country many years ago by one of our prominent national surgeons, N. N. Terebinskiy.

In a large number of clinics in the Soviet Union work is performed in the field of operations on the "dry" heart. Of primary interest is the clinic directed by P. A. Kypryanov who himself was a pioneer on the development of the intervention on the "dry" heart in our country. Moreover -- to these belong also the clinics, directed by B. V. Petrovskiy and N. M. Amosov and the clinic of the Institute of Surgery imeni A. V. Vishnevskiy. The Scientific Research Institute of Experimental Surgical Equipment and Instruments (NIIEKhA and I) directed by M. G. Anan'yev, constructed the apparatus "Artificial Heart-Lungs," which makes possible at the present time in the experimental laboratory and in the clinic, in an entirely practical way, an approach to the elaboration of the problem of the operation on the "dry" heart.

The session is interesting also for its reports on

on problems in surgery such as alloplasty; this became possible as a result of wide development of the chemical industry which gave surgery a nonreactive alloplastic material.

The session was then presided over by A. A. Bulasov who gave the report on "Operations on the Dry Heart" of A. A. Vishnevskiy. The exclusion of the heart in conditions of hypothermia, if the operation does not exceed six to eight minutes, is less dangerous for the patient and less complicated than in conditions of artificial circulation. Therefore the majority of the surgeons perform these operations, which can be done in six to eight minutes, in conditions of hypothermia (closure of the interauricular septum defect and resection of the valvular stenosis of the pulmonary artery and aorta). The operations with the use of artificial circulation are still accompanied by a high percentage of mortality -- from 25 to 30 percent. This technique is used in those reconstructive operations which cannot be performed in conditions of hypothermia.

During the last one and one-half years in the Institute of Surgery imeni A. V. Vishnevskiy, the problem of artificial circulation and exclusion of the heart in conditions of hypothermia has been elaborated. In these conditions five operations were performed (closure of the interauricular septum defect, elimination of the valvular stenosis of the pulmonary artery and aorta). The most serious complications are cardiac arrest and fibrillation. Defibrillation is used only in the presence of a sufficiently high tonus of the cardiac muscle. In flabby fibrillation and cardiac arrest in diastole, the tonus of the muscle is restored by means of elimination of hypoxia of the heart muscle, by artificial respiration, massage, and introduction of adrenalin into the left auricle or aorta. Among the five operated upon, two, in whom the closure of the interauricular septum defect was performed, improved and were demonstrated at the conference.

Eight operations were performed with the use of artificial circulation. The contractures of the heart to a certain degree disturb the operation; therefore in two patients cardioplegic drugs were used. The postoperative course in the patients operated upon with artificial circulation is very severe and is caused by postoperative and late hemorrhage and edema of the brain and lungs. Among the eight patients operated on, three died of hemorrhage, two of edema of the lungs, and one of brain edema. The percentage of mortality is very high, but the results of the first operation of the foreign authors were not better. They did not even include in the statistics the first twenty operations. It is necessary to carry on a careful and thorough elaboration of the two methods which make possible the operation on

the "dry" heart.

Three patients were demonstrated on whom were performed the "dry" heart operation. These were done in conditions of hypothermia and with the use of artificial circulation.

A message was left by B. V. Ognev, who congratulated the collective body of the Institute of Surgery imeni A. V. Vishnevskiy on two great international prizes, awarded for the book of Dzagaryan and for the construction of Donetsk's ring.

A report on "Operations on the Open Heart in Conditions of Hypothermia" was made by P. A. Kupryanov. The report informed that the intracardiac operations, performed under control of vision, are still not numerous. An analysis of the problem revealed two trends. The first concerns operations with the use of artificial circulation; this technique was accomplished for the first time in the experiment of N. N. Terebinskiy in 1926-1930. In our country A. A. Vishnevskiy and his fellow workers first accomplished the removal of the subvalvular stenosing ring in conditions of extracorporeal circulation with the use of hypothermia. This method is very complicated; therefore the second method consisting of exclusion of the heart from circulation in conditions of hypothermia for six to eight minutes continues today to be of great importance. The lecturer dwelt in detail upon the method of performing the operation. The most convenient appeared to be the combination of not-too-deep anesthesia with muscle relaxants, small doses of phenothiazine derivatives (chiefly diprazine), and small doses of the ganglion blocking agents (hexonium, pentamine, arfonad). For the closure of septal defects, right thoracotomy with sternal splitting is used, but without opening the left pleural cavity. Although the "closed" method of the removal of the stenoses of the pulmonary artery and closure of the interauricular septal defects give satisfactory results (according to the data of the clinic, 11.1 percent mortality), yet there is not always the feeling of assurance about the adequate efficiency of the operations. The lecturer assumed that exclusion of the heart from the circulation in conditions of hypothermia at body temperature 29-30°C within nine to ten minutes does not leave irreversible sequelae in the body. Within seven to ten minutes the operation can be successfully undertaken for interauricular septum secundum defect and for valvular and subvalvular stenosis of the pulmonary artery. The interventricular septum defect can be closed with great risk. In conclusion, the lecturer said that further perfection and incorporation of the method of artificial circulation into clinical practice is necessary, thus giving more time for operation on the open heart.

L. L. Shik in the report "Artificial Circulation as a Physiological Problem" stresses, that at present stage, the artificial circulation creates conditions which are far from physiological. The contemporary apparatus for artificial circulation secures sufficient oxygenation of the blood, but the danger of insufficient saturation remains substantial by the change of the order or work of the apparatus. Usually during an operation hypotension occurs. The blood pressure is an important physiological constant which out to be taken into account. Our further task is to learn its regulation, and this to a certain degree appears to be accomplishable. Supplementary investigations in physiology, biology, and hematology are necessary. In intracardiac operations and even in operation on the "dry" heart, the contractures of the heart muscle are the essential obstacles.

In relation to this, of interest are the observations made by NIIKHA and I, about which a communication was made by S. A. Mushegian and M. G. Anan'yev in their report "The Induced Cardiac Arrest." The lecturers noted its advantages in the visualisation of the operative field and the absence of reaction of the heart to a mechanical trauma. Most popular was the method of cardiac arrest by means of potassium ions. The authors performed 16 experiments on dogs. The heart and lungs were excluded from the circulation for various periods -- from 10 to 95 minutes. Among the observed complications the authors noted fibrillation and air embolism of the coronary vessels. The interruption of the fibrillation was performed by means of the repeated introduction of potassium citrate, more rarely, by means of the defibrillator. In the air embolism of the coronary vessels, the acceleration of the perfusion rate was demonstrated as the means for propulsion of the bubbles into the right auricle.

N. M. Amosov and his collaborators reported on the experimental investigations on 15 dogs with apparatus for artificial circulation constructed by A. G. Trubchaninov and O. M. Mavrodí. The lecturers noted that the apparatus is portable, does not require filling by the heparinized blood, secures a good gas exchange by the complete foam extinction and insignificant destruction of the morphological blood elements; he thinks that the application of this apparatus in clinical work is possible.

V. I. Burakovskiy reported the experience of the operations on the "dry" heart in conditions of hypothermia. Since March 1958 in the Institute of Surgery imeni A. V. Vishnevskiy, five operations were performed; two patients, after closure of the interatrial septum defect improved; three patients were lost. The lecturer points to the neces-

sity of precise diagnosis of the kind of defect of the interatrial septum and divides these patients into five groups depending on degree of pulmonary hypertension. For the patients of the fifth group the operation is contraindicated. In the opinion of the author, the calculation of the "Blood Shunt" through a defect and calculation of the diameter of a defect, is of important. Besides, the author speaks about the necessity of the prolonger preoperative preparation (intravenous glucose, vitamins C and B, adenosine triphosphoric acid, hyperventilation, and others), within 10-15 days. An account was given in detail of the operation and the control of complications. All cases of cardiac arrest were treated successfully.

A. M. Kudryaseva and A. S. Kharnas advised from their experience on the first operations on the heart using the apparatus for artificial circulation (AAC) in the clinic. These operations were performed in the Institute of Surgery imeni A. V. Vishnevskiy because of tetralogy of Fallot (six operations) and because of the intraventricular septum defect (two operations). The age of the patients varied from five to 26 years. Insertion of venous catheters of the apparatus was performed through the appendix of the right auricle into the inferior vena cava, through the innominate vein into the superior vena cava. The arterial catheters were introduced into the aorta through the subclavian artery in the first three operations, and in the successive operations through the femoral artery into the aortic arch. Consequently, the venous catheters also were introduced in another way -- through the appendix and the wall of the right auricle into the inferior and the superior vena cava. Prior to the operation an "artificial hemophilia" was produced in patients by means of heparin (according to the method of L. A. Levitska). The artificial circulation was included for 18-20 minutes. In patients with the interventricular septum defect, prior to cardiectomy, for the intentional cardiac arrest 2.5 percent of potassium chloride solution was introduced into the coronary arteries. A high interventricular septum defect of the size 2x2.5 cm was sutured with knitted silk sutures. In the second patient a defect 2X/cm was sutured in the muscular part of the septum. An abrupt fall of blood pressure, a change of the electric activity of the heart, a decrease of pH, a decrease of the alkali reserve, and a slow return to normal of the blood clotting lead to severe complications. Among eight patients, operated on with artificial circulation, six died of severe complications in the postoperative period. Two patients successfully stood the operation and the postoperative complications.

P. N. Mazayev in the report "The Clinical-Rentgenologi-

cal Diagnostics of Septal Defects of the Heart" stressed that in the elaboration of the problem of heart surgery and the main vessels, making diagnosis of the cardiac defects more precisely and detecting of hemodynamic disturbances in them are of a great importance. It is necessary to use widely cardiac catheterization, aortography, and angiography. A great portion of the work of the session was given to the methods of elaboration of postoperative complications. As is known, the operations on the "dry" heart excluded from the circulation by means of the apparatus for artificial circulation are performed in a state of hemophilia, and are always connected with a risk of hemorrhage. L. A. Levitskaya in her report on "The Methods of Control of Hemorrhage after Operation on the 'Dry' Heart with the Use of Artificial Circulation," discussed hemorrhage control. Hemorrhage can appear as a result of a series of factors, as: 1) artificial hemophilia and insufficient neutralisation of the heparin by protamine sulphate or, by introducing an excess of it; 2) the decreased coagulability of the blood (hypocoagulation).

Prophylactics and the measures of hemorrhage control after the exclusion of the AAC should be directed toward, first, the elimination of the artificial hemophilia; this means performing a proper neutralisation of the heparin with prothamine sulphate controlled by estimation of the prothrombin index (after Quick), of the free heparin, and of the time of blood clotting; second, the elimination of the hypocoagulability by means of such methods as the transfusion of the proper cations or direct blood transfusion. In an abrupt thrombopenia, the transfusion of the thrombocytic mass is indicated. Moreover, the factors disturbing the clotting system of the blood should not be forgotten. Hemorrhage is also dependent on the phenomenon of defibrillation of the blood, a device for which is set in with the inclusion of the apparatus for artificial circulation. The lecturer paid serious attention to the careful preparation of the AAC for an experiment: it is necessary to introduce sufficient heparin into the blood filling the apparatus, and to carry out the rational use of blood substitutes, thus preventing excessive dilution of the blood. In operations of the heart excluded from the circulation, of special interest are investigations of the functional state of the brain cortex, which reacts very quickly and sensitively to deficiency of oxygen and disturbances in circulation. In this respect, the electroencephalogram has great importance as an objective test of the functional state of the patient during the artificial circulation.

N. P. Proctova reported the results of the first

clinical observations, carried out in the Soviet Union, in the Institute of Surgery imeni A. V. Vishnevskiy, where by means of electroencephalography (EEG), control was carried on the state of the brain cortex during an operation on the "dry" heart with hypothermia and artificial circulation. The report of the lecturer makes apparent that during the opening of the pleural cavity, the EEG does not change, the exposure of the pulmonary artery and its branches in the absence of adhesions also occurs almost imperceptibly. The division of adhesions causes some disorganization of the EEG, and the features of the waves indicate hypoxia of the brain cortex. The exposure of the vena cava superior causes abrupt changes in the EEG curve (the characteristic high waves appear, without the quick rate). During the compression of the vena cava superior the characteristic waves increase progressively and remain within the whole period of compression, characteristic for a considerable hyhoxia of the cortex. It should be emphasized that the artificial hypothermia creates favorable conditions for the stability of the brain cortex and its ability to regenerate. The electroencephalographic control of the heart allows the discovery of distrubances in the brain cortex and the possibility of taking preventive measures.

The reports were discussed by Ye. M. Smirenskaya, S. A. Kolesnikov, A. N. Gurevich, A. A. Shalimov, Trybet-skoy, Dolgopol, and others. All the participants gave advice from their experience in the field of operations on the "dry" heart and a work-up of the physiological problem in its actual practice.

In conclusion, A. A. Busalov, presiding, remarked that the day's session was historical. It was the first major session contributed to the treatment of congenital heart defects by means of very delicate and difficult operations. A large portion of the conference program was contributed to the entirely new branch -- alloplasty in surgery. We are carrying out such an extensive consideration of this problem in the Soviet Union for the first time.

N. N. Prirov in the report "On the Problem of Alloplasty in Surgical Practice" cited the literature data and mentioned his material on the plasty of the joints. Also, he discussed the interesting data in cosmetic operations in the maxillofacial region. In conclusion the lecturer said that the final solution of the problem of restoration of tissues and organs depends on the state of study of the general biological compatibility and conservation of tissues and organs.

Great interest was stimulated by the report of Ye. N. Meshalkin on the subject "Experience on Alloplasty in the

Abdominal and Thoracic Cavities." Beginning in 1955, in the clinic, plastic sutures have been widely used for suturing wounds of the thoracic and the abdominal cavities (1,200 patients). Convinced of inertness of the plastic mass, the workers began to use plastic prostheses. Among the 35 performed operations, eight are related to the plasty of the abdominal wall, 15 to the prosthesis of the esophagus (three lethal outcomes). Eight operations were performed for valvular aortic stenosis with the use of prosthesis of the ultra-short action or an operative prosthesis. Three attempts of operative intervention were made with the use of the prosthesis of the aortic valve made in NIIEKhA and I, designed to pass eight liters of blood in a minute. Such a large prosthesis can be placed only in the ascending part of aorta. The first two operations were unsuccessful, and resulted in lethal outcome. The third patient on whom three operations were performed at the same time (aortic commisurotomy, mitral commisurotomy, and placing of prosthesis into the thoracic aorta), recovered and felt well. Ten operations were performed because of a coarctation of aorta with the use of homotransplants. In five cases the capron carcass prosthesis was used. Of particular interest is the last observation, where the aneurysm of the aortic arch was removed and the latter replaced by the capron prosthesis 12 cm in length. The patient feels well, the lower extremities are warm, and the vessels pulsate.

The report of A. N. Filatov and V. M. Malkinaya on "Alloplasty of the Blood Vessels," discussed the great number of experimental investigations on the problem of obtaining a synthetic material suitable for the construction of arterial transplants. Production of a synthetic material was reported (polyvinyl alcohol with organic reagents). The authors succeeded in production of their own domestic material, not yielding in quality to the imported materials, especially the polyvinyl sponge Ivalon. V. A. Zhmur presented interesting data on the subject "A Successful Alloplastic Replacement of the Aortic Aneurysm and its Bifurcation." The abdominal aortoplasty gave good results. In addition, the author gave advice from clinical experience on replacing the abdominal wall by a nylon mesh which grows firmly into a tissue, and the results are excellent. He showed a case of plastic repair of the diaphragm with a good clinical result. The replacement of the esophagus by the alloplastic material was unsuccessful. V. S. Krylov presented data on replacement of blood vessels by alloplastic material.

The experimental investigation was performed on 24 dogs. Six observations were made in the clinic. In all cases the author used manual suture of the vessels. A seam-

less prosthesis woven of a capron filament exceeds in quality all the previously tried kinds and forms of arterial prostheses. A very thin layer of the internal connective coverage on the 77th day after grafting is already entirely endothelialized and the process of integration can be considered as completed. The author draws the conclusion that a prosthesis woven of a capron filament can be used in clinical work for replacement of defects of large arteries. N. P. Petrov and O. R. Bogomolov in the report on "Alloplasty of Vessels with the Use of A Mechanical Vascular Suture" demonstrated in an experiment on 26 days, the possibility of use of a mechanical suture by application of Gulov's apparatus for suturing the plastic tube to the vessels. The observations were carried out for periods from five days to one year. For replacement of the thoracic and the abdominal aorta, the carotid arteries, and jugular veins, the capron prostheses were used in lengths from one to nine centimeters, both glued and woven throughout. In a histological investigation, a firm union between the prosthesis and the wall of the vessel was found due to a connective-tissue bridge. At the end of the second week the endothelium growth was 1.5 mm, and after seven months a thin structural capsule was formed. The prosthesis of the tube made of capron is absorbed in a period of not less than a year. Our domestic capron prostheses for large vessels give results analogous to those obtained by foreign authors.

T. T. Daurova in the report "Recanalisation of Esophagus and Replacement of its Defects by Alloplastic Prostheses in Operations of Carcinoma of Esophagus," informed about extremely interesting data on recanalisation of the esophagus and replacement of a segment of esophagus, affected by cancer in the upper and middle thirds, by the polyethylene tube. Among the 13 patients operated on four underwent the radical operation; in nine patients recanalisation was performed (in seven of them the inoperability was corrected during the operation). After the operation, two patients died of pneumonia, and two others are in good condition. Now, after the recanalization of the esophagus, all patients are alive, feel well, and are fed orally; the period of observation is from one to nine months. These investigations showed, that a recanalisation of esophagus by an alloplastic prosthesis in an inoperable cancer of the esophagus appears to be an uncomplicated operation and enables the patient to feed himself per os till the end of his life; therefore this operation is superior to a gastrostomy. But the author points out that the operation of replacing a defect of the esophagus by alloplastic prosthesis still offers many complications and needs improvement.

V. P. Melnikova presented interesting data in the report on "The Study of the Properties of the Alloplastic Materials, Used for Replacement of Esophagus in an Experiment and in a Clinic." Two kinds of domestic prostheses of polyacetal were tried: a more compact type and a softer type in the form of a pellicle prostheses.

From the outside the prosthesis was covered by a preserved homograft (aorta, peritoneum, dura, pericardium, esophagus). A total of 93 experiments were performed in the clinical cases, a construction of the by-passing prethoracic anastomosis of the allotransplantate of the English Ivalon and the domestic polyacetal with biological supplements was used in seven patients with inoperable cancer of esophagus. The results in a case of using polyacetal are good, markedly better than in the use of a prosthesis of Ivalon. However, the author considers that decisive in the elaboration of this difficult problem will be further improvement of the synthetic prostheses -- their forms and properties.

A. A. Olshanetskiy made a report on "Data for the Study of the Pellicle Plastic Transplantates." The problems of working out the means of control of adhesions, formed after replacements of defects in membranes of cavities by the plastic material, appear to be very important, since the use of plastic material in this field is speculative, especially in the plasty of the dura and the pericardium, and also in the substitution of large portions of the parietal peritoneum in peritonitis.

N. Z. Manakov reported about the experimental-clinical observations concerning capron and nylon meshes (28 cases), used for suture of hernial entrances, of kidneys and ovaries, and for fixation of the sigmoid colon. The healing was primary, the period of observation two years, the results favorable. Thus, the meshes of the capron and the nylon threads may be used in alloplasty for filling of tissue defects and fixation of organs. Their use enlarges the choice of operative appliances.

A series of reports, related to the old exciting surgical problem of gluing bones, substitution of steel nails by resorbable materials, attracted exceptional attention and interest of the conference. Here belongs the report of G. V. Golovin on "The Use of Synthetic Materials for Gluing of Bones." In 1955, the synthetic glue -- osteoplast -- was obtained for the seamless fusion of bones. An experimental observation was performed on 70 rabbits. The period of observation was three years. The results were good. The investigation of the preparation was started in the surgical clinic of the Leningrad Institute of Blood Transfusion. The osteoplast is used for the filling of

tube bones in order to increase the consolidation in pseudoarthroses, comminuted fractures, and osteoplastic operations. A. G. Lapchinskiy and Dr. Gruzdkova reported on the reconstruction of the outlines of the face, by means of implantation of the "vkladysh" [bushing?] of the plastic material.

The demonstrations presented a fully artistic reconstruction of the face.

The reports were discussed by V. M. Buyanov, Ye. V. Gruzdkova, N. M. Amosov, and R. P. Androsov.

In the concluding remarks, B. A. Petrov, presiding, devoted attention to each report and noted that these reports and discussions are of great interest. The most important appears to be the elaboration of the problem of the plastic operations of vessels, esophagus, and trachea (the last, regrettably, was not discussed).

Following the session, scientific films were shown with demonstration of an operation on the "dry" heart. The model operations were performed in the operating rooms of the Institute of Surgery imeni A. V. Vishnevskiy.

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